

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1-13. (Canceled)

14. (Currently amended) A method for producing a MIS transistor comprising a semiconductor substrate, source/drain regions formed on the semiconductor substrate, and a gate electrode provided above a channel region between the source/drain regions, said method comprising:

selectively forming a first film on said semiconductor substrate;

etching said semiconductor substrate to form a first groove by using said first film as a mask;

forming a second film in said first groove and thereafter removing said first film;

diffusing an impurity on a surface of said semiconductor substrate to form an impurity diffusion region including a part thereof extending below the first groove by using said second film as a mask;

forming an insulator film on said impurity diffusion region and thereafter removing said second film to form a second groove on the semiconductor substrate so that a top surface of the impurity diffusion region of the semiconductor substrate is higher than a bottom surface of the second groove;

forming a gate insulator film in said second groove with controlling a thickness of the gate insulator film so that a top surface of said gate insulator film is higher than a top surface of said impurity diffusion region; and

forming a gate electrode on the top surface of said gate insulator film.

15. (Previously presented) A method for producing a MIS transistor according to claim 14, wherein said second film is a semiconductor film, and further comprising:

forming a sacrificial film in said first groove before forming said second film in said first groove; and

removing said sacrificial film after removing said second film to form said second groove.

16. (Previously presented) A method for producing a MIS transistor according to claim 14, further comprising:

polishing a surface of said second film by using said first film as a stopper.

17. (Previously presented) A method for producing a MIS transistor according to claim 14, further comprising:

forming a protective film in said second groove before forming said gate insulator film in said second groove.

18. (Currently amended) A method for producing a MIS transistor comprising a semiconductor substrate, source/drain regions formed on the semiconductor substrate, and a gate electrode provided above a channel region between the source/drain regions, said method comprising:

selectively forming a first film on said semiconductor substrate;

etching said semiconductor substrate to form a first groove by using said first film as a mask;

forming a second film in said first groove and thereafter removing said first film;

diffusing an impurity on a surface of said semiconductor substrate to form an impurity diffusion region including a part thereof extending below the first groove by using said second film as a mask;

forming an insulator film on said impurity diffusion region and thereafter removing said second film to form a second groove [[in]] on the semiconductor substrate so that a top surface of the impurity diffusion region of the semiconductor substrate is higher than a bottom surface of the second groove;

forming a gate insulator film in said second groove and on said insulator film;

polishing said gate insulator film by using said insulator film as a stopper with controlling a thickness of the gate insulator film so that a top surface of said gate insulator film is higher than a top surface of said impurity diffusion region; and

forming a gate electrode on the top surface of said gate insulator film.

19. (Previously presented) A method for producing a MIS transistor according to claim 18, wherein said second film is a semiconductor film, and further comprising:

forming a sacrificial film in said first groove before forming said second film in said first groove; and

removing said sacrificial film after removing said second film to form said second groove.

20. (Previously presented) A method for producing a MIS transistor according to claim 18, further comprising:

polishing a surface of said second film by using said first film as a stopper.

21. (Previously presented) A method for producing a MIS transistor according to claim 18, further comprising:

forming a protective film in said second groove before forming said gate insulator film in said second groove.

22. (Currently amended) A method for producing a MIS transistor comprising a semiconductor substrate, source/drain regions formed on the substrate, and a gate electrode provided above a channel region between the source/drain regions, said method comprising:

selectively forming a first film on said semiconductor substrate;

diffusing an impurity on a surface of said semiconductor substrate to form an impurity diffusion region including an elevated impurity diffusion region in a groove from a channel region by using said first film as a mask;

forming an insulator film on said impurity diffusion region so that a top surface of the impurity diffusion region of the semiconductor substrate is higher than an upper level of the channel region;

removing said first film so as to form a groove on the semiconductor substrate;

forming a gate insulator in said groove on the semiconductor substrate with controlling a thickness of the gate insulator film so that a top surface of said gate insulator film is higher than a top surface of said impurity diffusion region; and

forming a gate electrode on a top surface of said gate insulator film.

23. (Previously presented) A method for producing a MIS transistor according to claim 22, further comprising:

elevating said source/drain region by an epitaxial growth technique before diffusing said impurity on said surface of said semiconductor substrate to form said grooved impurity diffusion region including said elevated impurity diffusion region from said channel region by using said first film as a mask.

24. (Previously presented) A method for producing a MIS transistor according to claim 23, further comprising:

diffusing an impurity on said surface of said semiconductor substrate before elevating said source/drain region by the epitaxial growth technique.

25. (Previously presented) A method for producing a MIS transistor according to claim 22, wherein said first film is semiconductor film and further comprising:

forming a sacrificial film on a surface of said first film; and
removing said sacrificial film.

26. (Previously presented) A method for producing a MIS transistor according to claim 22, further comprising:

forming a protective film in said groove before forming said gate insulator film in said groove.

27. (Currently amended) A method for producing a MIS transistor comprising a semiconductor substrate, source/drain regions formed on the substrate, and a gate electrode provided above a channel region between the source/drain regions, said method comprising:

~~selectively~~ forming a first high dielectric film to be a gate insulator film on said semiconductor substrate;

sequentially depositing a laminated film on said high dielectric film by a polycrystalline semiconductor film to be a gate electrode;

etching said laminated film so as to form said gate electrode and thereafter forming side walls at a side of said gate electrode;

etching said high dielectric film so as to form said gate insulator film by using said gate electrode and side walls as a mask and forming a side wall insulator film at a side of said gate insulator film; and

diffusing an impurity on a surface of said semiconductor substrate to form an impurity diffusion region including an elevated impurity diffusion region from a channel region with controlling a thickness of elevated impurity region by using said first gate insulator film as a mask, so that a top surface of the gate insulator film is higher than a top surface of the elevated impurity region and that said top surface of the elevated impurity region is higher than a top surface of said channel region of the semiconductor substrate.[:,:]

~~forming an insulator film on said impurity diffusion region;~~

~~removing said first film so as to form a groove in the semiconductor substrate;~~

~~forming a gate insulator in said groove in the semiconductor substrate and on said insulator film;~~

~~polishing said gate insulator film by using said insulator film as a stopper so that a top surface of said gate insulator film is higher than a top surface of said grooved impurity diffusion region; and~~

~~forming a gate electrode on a top surface of said gate insulator film.~~

28. (Previously presented) A method for producing a MIS transistor according to claim 27, further comprising:

elevating said source/drain region by an epitaxial growth technique before diffusing said impurity on said surface of said semiconductor substrate to form said grooved impurity diffusion region including said elevated impurity diffusion region from said channel region by using said first film as a mask.

29. (Previously presented) A method for producing a MIS transistor according to claim 28, further comprising:

diffusing an impurity on said surface of said semiconductor substrate before elevating said source/drain region by the epitaxial growth technique.

30. (Previously presented) A method for producing a MIS transistor according to claim 27, wherein said first film is semiconductor film and further comprising:

forming a sacrificial film on a surface of said first film; and
removing said sacrificial film.

31. (Previously presented) A method for producing a MIS transistor according to claim 27, further comprising:

forming a protective film in said groove before forming said gate insulator film in said groove.

32. (Previously presented) A method for producing a MIS transistor comprising a semiconductor substrate, source/drain regions formed on the substrate, and a gate electrode provided above a channel region between the source/drain regions, said method comprising:

forming a dummy film on said channel region, which borders said source drain regions;

selectively depositing semiconductor layers serving as said source/drain regions so that an inclined surface is formed between the top surface of said semiconductor substrate and said channel region;

diffusing an impurity on a surface of said semiconductor substrate to form impurity diffusion regions by using said dummy film as a mask and thereafter removing said dummy film;

depositing an insulator film on an exposed surface of said channel region to form a gate insulator film, which has a cross section of a grooved space at a center thereof; and

depositing a gate electrode on a top of said gate insulator film to form a gate electrode having a cross section of a T shape.

33. (Previously presented) A method for producing a MIS transistor according to claim 32, further comprising forming a gate insulator film from said insulator film in said second groove so that a top surface of said gate insulator film is higher than a top surface of said grooved impurity diffusion region.

34-39. (Canceled)